

NERRS Science Collaborative Progress Report for the Period 9/1/13 through 2/28/14

Project Title: Integrating Socio-Ecological Research and Collaborative Learning to Promote Marsh and Community Resilience

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Contributing team members and their role in the project:

Project coordinator: Brian Needelman

Collaboration lead: Michael Paolisso

Fiscal agent: Robert Tjaden

Applied science investigators: Patricia Delgado, Chris Snow, Lindsay Carroll, Sasha Land, Coreen Weilminster, Lisa Wainger, Paul Leisnham, Andrew Baldwin, Donald Webster, Erin McLaughlin, Kevin Smith, Patrick Megonigal, Christine Conn, Sean McGuire, Roman Jesien, Natasha Leuchanka

Intended user representatives: Captain Stoney Whitelock, Roy Ford, Michael Cantwell, Steve Strano, Susan Adamowicz

A. Progress overview

The goals of this project are to: 1) Establish a continuing collaboration among local community, state and federal agency, academic, and non-governmental organization stakeholders working towards the resilience of the marshes and local communities of the Deal Island peninsula; 2) Develop and test a broadly transferable process of engaging stakeholders to optimize and implement strategies that restore and conserve marshes and local communities; and 3) Better understand the provision of socio-ecological services by marsh systems and decision-making processes within the stakeholder community using integrated anthropological, economic, and ecological applied science.

We are using collaborative learning as our key methodology for stakeholder engagement. During this period we held our second and third stakeholder workshops and worked with our three Collaborative Research Projects (CRP) on the subjects of Heritage, Flooding, and Marsh Restoration. Our applied science research includes ecological, economic, and anthropological components. During this project period we continued extensive ecological data collection at seven field sites, continued economic data collection and analysis using a Q-sort methodology, and begun to conduct anthropological data collection.

B. Working with Intended Users

In this section of the report, we describe the collaborative learning element of our project, which is our key method for working with our stakeholders. We also discuss our outreach and education efforts.

- **Describe the progress on tasks related to the integration of intended users into the project for this reporting period.**

Since September, project collaboration has achieved a number of milestones. We held our second and third workshops with our stakeholders and further developed and made progress with our smaller working teams (Collaborative Research Projects: CRPs) to further the work of these groups towards their shared goals and objectives.

Governance

The collaborative learning process is being conducted using a variety of means and mechanisms. Michael Paolisso, the Collaborative Lead, is our primary contact with local community stakeholders. He has worked closely with project director Brian Needelman and Katherine Johnson in developing protocols and materials to be discussed with the project's Collaborative Science Team (CST). The CST is comprised of representatives of the project's research disciplines: Paolisso (anthropologist), Needelman (ecologist), Johnson (anthropologist), Bob Tjaden (economist), Lisa Wainger (economist), Diane Leason (ecologist), and Sasha Land (training and outreach). The CST holds weekly teleconferences to discuss project collaboration activities. All have been involved in identifying, initiating, and maintaining stakeholder contacts.

With this next phase of the project, and the introduction of the CRPs, the Collaborative Science Team has changed slightly and now serves a dual purpose to be a means of communication regarding the CRPs. Each CRP has stakeholder leadership representing the local communities and other organizations. Together, the Collaborative Science Team and CRP leaders will help to provide the organizational support for the three CRP teams.

Stakeholders

We currently have over 50 collaborative learning project stakeholders. They represent the grant, the local community, and officials and managers from local and regional organizations. While not all of the stakeholders are ever able to make it to our large events (1st workshop, CRP kick-off meeting) we maintain contact with those absent and send summaries or reports to keep them up to date.

Collaborative Research Project (CRP) Teams:

The purpose of the collaborative research projects are to:

- To collect information on heritage, flooding and marsh restoration for the Deal Island Peninsula
- Bring together project stakeholders' knowledge and expertise;
- Identify cultural, social, economic, and ecological information relevant to community and marsh adaptation to climate-related change;
- Identify individuals, institutions and decision-makers who can use information collected by CRPs in ways that increase community and marsh resilience;
- Provide a mechanism to inform and engage a wider range of interested individuals in the project; and
- Achieve some group-based decisions on future actions to improve community and marsh resilience to sea level rise and flooding.

We have three CRP Teams:

Heritage: Heritage is an important topic to the Deal Island Peninsula communities. A number of our stakeholders represent organizations that are working to promote heritage research and conservation. Heritage is a concept that can mean both public and private heritage. The latter is defined as "what a community wants to pass on to the next generation." (Note: private and public heritage do overlap.) The project can complement existing heritage work in the communities, which focuses on public heritage (e.g., material culture for display), by collecting additional information on private heritage through interviews. Improved shared understanding of private and public heritage can be a cultural asset that helps promote community identity and a sense of belonging. Such cultural beliefs and values can help make a community more resilient in the face of future ecological and socio-economic challenges, including climate change. The

marshes are a major site of heritage construction. They provide a service in helping to sustain community heritage, along with fisheries and other local social processes.

Flooding: A major concern for the Deal Island Peninsula and its communities is flooding, including the possibility on increased flooding due to climate change and sea level rise. The topic of flooding surfaced many times during our discussions with project stakeholders and at the first workshop. A project focused on flooding could include a wide range of topics, such as historical to current patterns of flooding, economic costs of flooding, marshes to mitigate storm surges, shoreline protection, sea level rise impacts, flood insurance, adaptation options and policies at county, state and federal levels, etc. Research on these processes and impacts is a service that will provide knowledge and help build social relations between project stakeholders and others that could help improve marsh and community socio-ecological resilience. In particular, learning about how the marshes respond to flooding and/or function to regulate flooding and or can be protective against flooding would be very useful to community stakeholders, including how changes in marshes will affect future flooding on non-marsh lands where they reside and areas of potential non-marsh to marsh transition.

Marsh Restoration: The local marshes provide many cultural, economic and ecological services. The marshes are vulnerable to sea level rise and flooding, which are projected to increase with climate change. We are exploring options for ditch-drained marsh restoration within our project; this collaborative research project will include this work as well as other marsh restoration and management options in the peninsula. Project stakeholders are very interested in the drivers of ecological change in the marshes and cultural and economic benefits that are at risk due to changing climatic conditions. Possible topics of relevance to marsh socio-ecological services include GIS mapping of past and present uses of the marshes; identification of locations in the marshes at risk of SLR impacts or not; cultural and economic benefits and services of the marshes; identification of marsh areas that are most suitable for restoration and would provide the greatest benefits; and the general potential and limitations of restoration.

Participation in these three CRP teams is voluntary and based on a stakeholder's interests. Each team has about 14 members. Leadership from among the stakeholders within each CRP combined with support from the Collaborative Science Team serves as the organizing body for each team. There are some stakeholders for whom participation in the CRPs is not feasible, these people are kept informed of what is happening in the CRPs and invited to our stakeholder workshops.

Workshops

Since August 2013 we have held two project workshops and the Collaborative Research Project (CRP) groups have begun developing work plans. The CRP groups, especially, have been the best site for stakeholder interaction and dynamic interface.

October 2013 Workshop

At the October workshop Dr. Needelman presented updates on ecological research regarding marsh ditching, vegetation, geospatial data, marsh accretion, sea-level rise, and land subsidence. Dr. Needelman stressed that sea-level rise will compound natural subsidence and sea-level rise is already occurring. Dr. Wainger presented some preliminary findings from economic data collection related to ecosystems services for the Deal Island Peninsula area. Ms. Land and Ms. Leuchanka presented our newly developed website (<http://dealislandmarshandcommunityproject.org/>) and other potential web-based project resources. These presentations outlined the work that has been done by grant researchers and shared some initial findings of that work with our project stakeholders. We feel this is an

important component of our work that project stakeholders can further share with community members.

The CRP groups also met during the day-long workshop. Their primary goal was to have some initial conversations on how to develop a group scope of work. Since these groupings of individuals are unusual in their composition (containing community members, officials and managers as well as scientists), much discussion has been needed to help develop the scope and priorities that each group will undertake cooperatively. This meeting served as a start to build group cohesiveness. A key focus of conversation was also how to link the scientific project work to the collaborative objectives of the CRP groups.

February 2014 Workshop

The February workshop served to once again bring together project stakeholders and foster open communication amongst the groups. Presentations were given regarding: ditch plugging, living shorelines, coastal resiliency assessment activities, website and Facebook opportunities, and fostering youth involvement. Additional activities were conducted including an activity to collect additional socio-economic information regarding ecosystem services (and to collect initial data on this topic from those who missed our July workshop) as well as time for the CRP groups to meet.

Comments from several stakeholders have given the impression that they felt this was the most successful project workshop to date. Stakeholders are noticeably more comfortable interacting with each other; the diversity of opinion has been highlighted as a beneficial aspect of our project work rather than a point of contention.

CRP Group Development

The Collaborative Research Project groups have met three times now, with one group meeting an additional two times. The idea for the collaborative research projects was initiated so that project stakeholders could have a greater ability to influence work plans for grant activities and to steer the discussion in more focused ways. The three groups: flooding, heritage, and marsh restoration vary widely in participant engagement and accomplishments to date. The flooding group has had the most daunting task in identifying what aspects of flooding vulnerability they will concentrate on. Currently, their plans are to narrow their focus geographically while broadening their focus to include storm surge and erosion. It is hoped that with this additional focus some substantive activities can be developed that will help to inform additional work along the Peninsula. The work of the marsh restoration team has been focused in bringing together their diverse stakeholder constituents. Key stakeholders include watermen, environmental managers, and marsh scientists. Focusing on what work can be accomplished through the synergy between these varied parties has resulted in a work plan that is highly tailored to help make progress in ways that will be beneficial to the creation of a stronger network focused on marsh restoration in the future. Our Heritage CRP group has made the most progress, most likely because the group has been able to build on the strengths of existing groups interested in the heritage of the area. These organizations have now come together to initiate some heritage collection activities and are building this data collection on inter-group cooperation and activities are supported through grant-funded equipment purchases.

- **What did you learn? Have there been any unanticipated challenges or opportunities?**

We have learned that project stakeholders are enthusiastic about the collaboration with each other within and across the CRPs. A challenge that has emerged is how to assist stakeholders in expressing their own knowledge and values, and worry less about whether their ideas are good enough or the right ideas. We are constantly reinforcing the important goal that we desire

the integration of all ideas in our CRP discussions and actions. We anticipate that throughout the project we will need to continue to reinforce the ideal, particularly for community stakeholders, that all knowledge and values can be discussed through the collaborative science process.

Our team has also learned that communication with various stakeholders (including the project team) has been quite time intensive and requires multiple strategies. Meetings, email, phone calls, or face-to-face conversations have been key depending on the group/individual. Managing this has been challenging, and has required more time to organize people for workshops and activities than was expected.

- **Has interaction with intended users brought about any changes to your methods for integration of intended users, the intended users involved, or your project objectives?**

Yes, we have made two significant adjustments to our methods as a result of interactions with our stakeholders. Our initial plan was to select three focus socio-ecological services for Collaborative Research Projects (CRPs). However, after the first workshop and through other interactions we found that individual services were too specific, our stakeholders were thinking and conceptualizing the socio-ecological system at a broader scale. For this reason, we chose higher-level focus areas for the CRPs: heritage, flooding, and marsh restoration.

Also, we found that we didn't have the appropriate structure in our project organization for outreach and education; we therefore have formed an Outreach and Education Team consisting of Brian Needelman, Sasha Land, Michael Paolisso, Coreen Weilminster, Natasha Leuchanka, and two community members: Nancy Goldstein and Eileen Cross. This group is responsible for project-wide messaging and communication, coordination of outreach and education activities, and takes the lead on outreach activities such as our display at the Skipjack Heritage Festival, our newsletter, and our website. The annual Skipjack Festival is a family-friendly event which occurs over Labor Day weekend at Deal Island. The 2014 event served as an opportunity to reach out to community members and visitors not directly involved in the project. It also was a helpful deadline for the Education and Outreach Team to develop initial outreach and education materials, such as brochures, informational displays, and a project website.

Additional Stakeholders

As our project work has continued, we have acquired additional stakeholders through word of mouth from current project stakeholders. The group has continued to grow and we believe that is an indication of the value that stakeholders feel in being involved in our project to build resilience among marsh and community through this project. The lines between stakeholders and intended users is blurred but the support from additional members seeking to be involved in our work makes us hopeful that as we move into the communication phases of our grant much of the community and our stakeholder's larger networks will be interested in the work we're doing.

- **How do you anticipate working with intended users in the next six months?**

The CRP groups will be continue to be highly active during this project period and will be the focus of our work with stakeholders. The CRPs have finalized specific tasks to complete during this time period, including activities such as public presentations, site tours, invitation to heritage collection activity events, interviews, data compilation, and literature reviews. We will communicate with the CRP members through the CRP co-leads, as described above. The

major stakeholder event during this project period will be the fourth workshop scheduled for October 19th. Our Outreach and Education Team will oversee our preparations for our display at the 2014 Skipjack Heritage Festival; the writing and distribution of our newsletter; and the writing, publication, and advertising of our website.

C. Progress on project objectives for this reporting period:

In this section, we discuss our progress related to the applied science-related objectives of the project, including ecological, economic, and anthropological research. This work is integrated into the collaborative learning process and stakeholder integration as described under Section B.

- **Describe progress on tasks related to project objectives for this reporting period.**

Ecological applied science

We have continued to make progress on the ecology research. To date, we have collected data, performed laboratory analyses, and conducted analysis of data on hydrology, vegetation, mosquitoes, soils, elevation, nekton, sedimentation, and water quality (see detailed list below). We have also completed the installation of the following field equipment at our field sites: wells and water-level loggers, salinity loggers, piezometers, vegetation/mosquitoes/soils plot markers, surface elevation tables, and weather stations.

Methodological summary

Sites

We have seven field sites in this study: five on Deal Island and two at the EA Vaughan Wildlife Management area, a coastal bay site on the eastern shore of Maryland. The EA Vaughan site is outside of the Deal Island Peninsula but is included because it has been established as a restoration study site since 2007 and its inclusion will facilitate the future transfer of our research results to coastal bay communities. The study sites include three pairs of ditched and unditched marshes (two pairs on Deal Island and one at EA Vaughan) and a reference unditched site at the Monie Bay CBNERR-MD site on Deal Island, where data collection will build upon ongoing monitoring efforts.

Data collection methods summary

- Water level and salinity (continuously logged in wells)
- Water pressure (collected during mosquito sampling events at 3 nested piezometers located at 20 plots per site)
- Vegetative species composition and cover (20 plots per site annually)
- Aboveground biomass (20 plots per site annually)
- Belowground productivity (using root in-growth cores) (20 plots per site annually)
- Mosquito larval density and species (40 plots per site 2-3 days following spring tides and following selected storm events)
- Soil horizonation (to one meter) (20 plots per site annually)
- Soil water content and bulk density (20 plots per site annually by soil horizon)
- Soil carbon and nitrogen content (20 plots per site annually by soil horizon)
- Soil rubbed fiber content (20 plots per site annually by soil horizon)
- Elevation (collected using laser leveling at all plots, well locations, and along drainage ditches and creeks; connected to GPS long-term occupations at local benchmarks)
- Surface accretion (using feldspar marker horizons measured twice a year)

- Elevation dynamics (using three Surface Elevation Tables per site; shallow SETs measured four times a year and deep SETs twice a year during the growing and non-growing seasons)
- Nekton (measured twice a year during the summer)
- Water quality (measured twice a year during the summer)
- Sedimentation (using sedimentation tiles)

Preliminary mosquito results

In 2012 and 2013, almost all collected mosquitoes were only one species: *Anopheles bradleyi*. In 2012, unditched sites had 2-3 times the proportion of sample plots on the marsh surface infested by mosquitoes compared to the ditched sites at two of the three paired locations (EAV1-2 and DEA3-4). The third paired location (DEA1-2) had very little infestation. Findings for 2013 were broadly consistent with those in 2012, with 2-3 times the proportion of sample plots infested by mosquitoes compared to the ditched sites at both EAV1-2 and DEA3-4. In 2013, only 1/80 plots had mosquitoes at DEA1-2. Consistent with past studies, mosquitoes varied considerably in space and time. In 2013, we expanded sampling to include ditches, permanent ponds and creeks, and ground pools in upland forested sites that bordered EAV1-2 and DEA1-2. We found that mosquitoes were collected more regularly in forested sites than on the marsh surface or in ditches and ponds.

Marsh elevation change

Data collection using deep and shallow SETs as well as marker horizons started in 2012. A preliminary analysis of shallow SET data showed no significant difference on shallow elevation change (or elevation change within the marsh root zone) between ditched and unditched sites. Similarly, when comparing only Deal Island sites no significant differences were found between ditched and unditched marshes. However at E. A. Vaughn, ditched sites showed greater shallow marsh elevation change than unditched sites.

Marsh vegetation

Aboveground biomass is measured annually during peak growing season. A preliminary analysis of 2012-2013 data did not show a treatment effect but a significant year by treatment interaction indicating that aboveground biomass differences between ditched and unditched sites varies between years. A third year of data will be collected in 2014 (post-restoration) and added to the analysis. While species composition varies between sites, dominant species based on biomass and cover estimates are *Juncus roemerus*, *Spartina alterniflora*, and *Spartina patens*.

We are estimating below ground production using root in growth cores. Root bags are installed and extracted annually beginning in 2012. All samples have been processed but the data collected has not yet been analyzed.

Economics applied science

Progress overview

We are exploring how ecosystem service language and metrics can be better matched to user values with the short term goal of integrating a full range of stakeholders in management of the Deal Island Peninsula socio-ecological system and the long-term goal of improving valuation techniques and communication between scientists, managers, and the public.

Approach

The economics component of the project is tightly integrated with the social science research as we jointly seek to gain a fuller understanding of how people benefit from marsh ecosystems and the socio-ecological services they provide. In addition, the economics team is testing several hypotheses regarding how people form values for ecosystem services and what language works to best communicate those values. To inform this research, we are eliciting values at multiple points in the process using Q-sorts of the stakeholder group.

A Q-sort is a common social science research tool used to assess diverse viewpoints on a topic. The Q-sort is conducted by having participants sort statements about a topic within a distribution from more to less important. The technique is similar to pile-sorting techniques that are also in widespread use, but it requires the respondents to set priorities as to the most and least important issues related to a topic.

The socio-economic applied research team conducted a Q-sort at the beginning of the Collaborative Research Projects (CRP) community workshop on July 24, 2013. A total of 26 people, including the research team, attended the workshop and participated in the sorting exercise. Stakeholders at the CRP workshop were asked to distribute 19 cards, each containing a socio-ecological service, along a pre-determined distribution from most and least important to sustain. The statements on the cards represented socio-ecological services, which were derived from stakeholder input during the first stakeholder workshop held in April 2013 (Table 1).

Data were analyzed using factor analysis to test for several effects including similarities across stakeholder groups and patterns across and among different types of services. We were surprised to learn that almost all stakeholders shared their most important priority, even though they showed different patterns of concerns overall. What is particularly interesting about this result is that it shows that stakeholders are thinking about long-term benefits and not just short-term amenities from the interaction of the marsh and community. Specific details of the analysis are being purposely withheld to avoid influencing future Q-sorts. However, the preliminary data suggest that the analysis will yield useful results for understanding stakeholder perspectives, motivations for change, and common ground among diverse stakeholders.

A second Q-sort data collection was conducted during the February 2014 workshop with stakeholders that were not present at the first data collection event.

Table 1. Socio-ecological services used in Q-sort

Socio-Ecological Services
Marshes reducing storm and erosion impacts
Natural mosquito control (from marsh ecosystem)
Marsh system vitality over the long-term
Teaching children about nature and stewardship
Beautiful place to live
Global climate regulation (from carbon sequestration)
Marsh study to promote scientific knowledge
Livelihood for watermen
Active commercial areas (restaurants, stores, etc.)
Locally caught seafood for sale
Local heritage tourism
Habitat for juvenile fish, crabs and oysters
Safe water for swimming and boating
Understanding of heritage and culture of area
Attractive natural setting
Successful fishing and hunting
Wildlife habitat for enjoyment or use by future generations
Property value protection (home price appreciation)
Seeing nature and wildlife

Anthropological applied science

The anthropological applied science on the grant has been enhanced by opportunities for stakeholder interaction through phone calls, meetings, workshops, and clandestine interaction. A key feature of this work has been in identifying and better understanding the conceptualizations that stakeholders hold and utilize as they go about their individual and collaborative work on the grant. Our commitment to varied understandings has allowed us to come together and attempt to work through project issues without imposing specific definitions or understandings of key concepts—such as resilience and climate change—on the group.

We have begun interviews that will elucidate further the individual and group conceptualizations of resilience, vulnerability, and better identify the socio-ecological system of the Deal Island Peninsula. It has been key to wait until this point in the grant to begin doing some of this work so that people have been exposed to a number of ideas and can better articulate their own position within the context of other known perspectives on the grant.

Increased Commitment to Project Organization and Relationship Clarification

Work with the CRPs has pointed out the need for additional conceptualization of the relationship between project stakeholders and our overall project goals. Many project stakeholders are simultaneously individuals participating in a collaborative project as well as representatives from other organizations with their own priorities. The extent to which stakeholders identify with their organizational responsibilities or with the project in general is an important point of variability. With local community members, especially, there has been an additional need to clarify the relationship between the project and their represented organizations. The fact of the matter is that stakeholders were chosen because of their affiliation with particular organizations or aspects of organizational capacity in the region and we must be cognizant to support the organizational responsibilities of stakeholders in addition to their needs

as individuals in participating in a collaborative process. This is particularly true in the context of the heritage CRP group, but is also relevant in the case of scientists participating as general stakeholders on the project.

- **What are your plans for meeting project objectives for the next six months?**

We will continue to collect ecological field data, conduct laboratory analyses, and analyze data. The marsh restoration is scheduled to occur in March 2014.

For the applied anthropological science, we will be implementing semi-structured interviews with project stakeholders to further elicit core cultural and social information that influences collaboration and also contribute to marsh and community resilience. We will also include in these semi-structured interviews questions that help us further define and understand the concept of resilience, and the structure and process of the emerging socio-ecological system within which practices of resilience are framed. We will also develop a survey to collect quantitative information that should help us measure the degree of sharing among project stakeholders, and the communities they represent, in their understanding and practice of marsh and community resilience in the face of climate change impacts.

Overall, we will continue our efforts to investigate and analyze the socio-ecological system through interviewing and other data collection. Research in the CRP areas of flooding, marsh restoration, and heritage (as outlined above) will be ongoing, requiring collaboration between project team members and the community via collaborative learning activities. Our focus will be on integrating the anthropological, economic, and ecological research within the collaborative learning process to build resilience for the Deal Island Peninsula.

D. Benefit to NERRS and NOAA

The process by which the project is using to engage stakeholders through the community workshops and Community Research Projects is one that can be replicated by the NERRS for a variety of projects. Though this is still in the intermediate stages, there is a high level of involvement from many different sectors. An Outreach and Education Team for the project has been formed to help communicate about the different aspects of this project. Moving forward the products and outcomes from this group could serve as examples on how to engage different audiences about the work of Science Collaborative Projects.

The protocols utilized and the monitoring infrastructure that has been put in place through this project have the potential for this study area to become a climate change sentinel site in the future. This is highly valuable in establishing another location in a vulnerable coastal area to understand more locally the impacts of a changing climate. Through the networks that the project is establishing/identifying, the information generated has the potential of being utilized in management and restoration decisions.

Our outreach and education materials are not scheduled to be produced until later in the project timeline. Some preliminary outreach and education materials were produced in preparation for the annual Skipjack Festival at Deal Island on Labor Day weekend including informational brochures and display boards that describe the project, why it is happening, its components, partners involved, how those interested can get involved, and who to contact for more information.

- E. Describe any activities, products, accomplishments, or obstacles not addressed in other sections of this report that you feel are important for the Science Collaborative to know.

None.